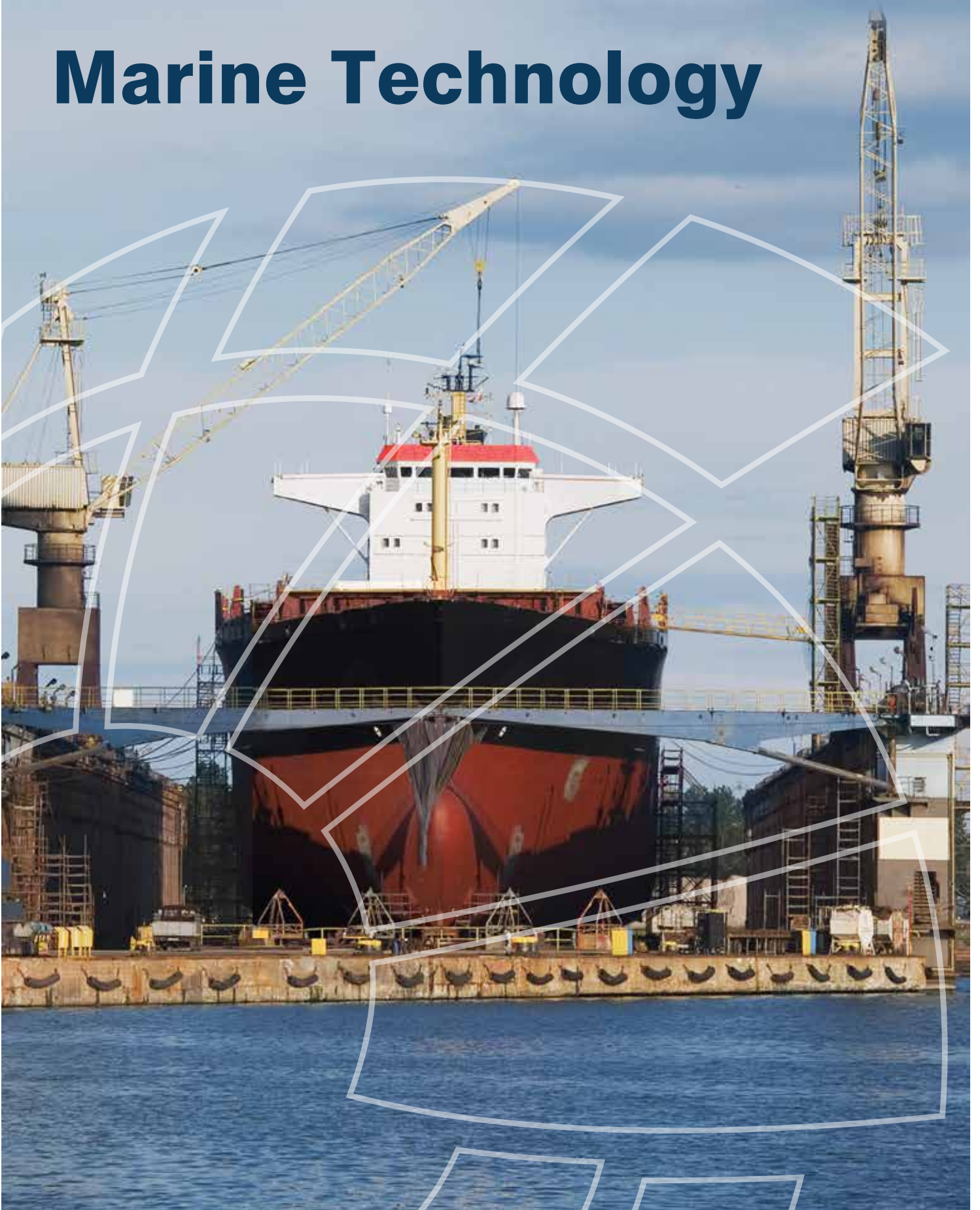




"Where will our knowledge take you?"

Marine Technology





The Company

BMT is a leading international multi-disciplinary engineering, science and technology consultancy offering a broad range of services, particularly in the defence, energy, environment, shipping and general transportation sectors. With around 1,500 professionals located in 60 offices in Europe, Asia and the Americas we draw upon a wide range of experience and expertise to provide high-quality, high-value products and services. These aim to help our customers operate their businesses in the most cost-effective, safe, reliable and environmentally responsible manner.

BMT WBM is an Australian subsidiary that was established in 1969 to provide specialist engineering and environmental consultancy services to a broad range of industries. Our professional engineers, scientists and technicians are highly qualified and collectively have vast experience in a broad range of fields.

An open-minded approach enables BMT WBM to characterise root causes of problems and provide definitive solutions. The benefits of these services are improved quality, robustness, reliability and availability of machinery, greater safety, avoidance of unexpected operational problems, extended life and lower life cycle operating and maintenance costs.

BMT WBM engineers have extensive shipping, offshore and harbour industry experience including naval vessels, ferries, tugs and supply vessels, bulk carriers, drilling rigs and underwater vehicles.

Our Marine Technology services range from the design of bulk ore handling equipment, along with shafting and mechanical systems to global finite element analysis. In addition, full commissioning trials and troubleshooting rectification services are provided to designers, builders, operators and repairers.

Associated consulting services are in port and materials handling machinery, water and environmental engineering, including coastal, hydraulic and water quality investigation and management, together with marine and terrestrial ecology.

AS/NZS ISO 9001:2000, ISO 14001, OHS / AS 19001, AS/ NZS 4801

Services



Design Stage including Modifications and Repairs

Our key services include:

- Design of bulk materials handling systems for self-unloaders and similar vessels, including PLC and SCADA system programming
- Shafting system design and analysis, including lateral and torsional vibration
- Structural design and analysis of lifting or recovery systems at the build stage, or for upgrades / change of function modifications
- Finite element analysis to class criteria, ranging from global to localised structural areas and joint detailing. Modification advice and analysis. Structural optimisation, material selection including composites, vessel weight reduction
- Computational fluid dynamics including hull and superstructure flows, submerged and towed objects, ventilation ducting, and propeller optimisation
- Customised permanent monitoring and data acquisition systems, including strain gauges, accelerometers, pressure transducers and associated amplifier instrumentation
- Fatigue analysis based on high cycle and low cycle cumulative loadings. Design of improved joint details, welding processes, optimised local post-weld treatments
- Re-powering feasibility and upgrades including assessments for re-engineering, alternative propulsion systems



Commissioning

Full Trials Monitoring and Analysis

- Speed/power
- Shaft torque and torsional vibration
- Shaft alignment via strain gauging and influence coefficient technique
- Structural strain / stress, fatigue analysis
- Machinery and plant vibration
- Noise levels
- Bollard pull including dynamic tow forces
- Seakeeping and manoeuvring assessments, ride control optimising, hull slamming

Weighing of Vessels and Components

Structural and Associated Proof Load Testing

- Winches
- Cranes and davits
- Stanchions
- Life lines

Operation/Maintenance

Hull Stress, Vibration and Fatigue, Troubleshooting

- Strain gauging, vibration
- Failure modes and effect analysis
- Root cause sources
- Correlations with FEA
- Design of rectifications

Structural and machinery repair specifications and procedures, quality assurance



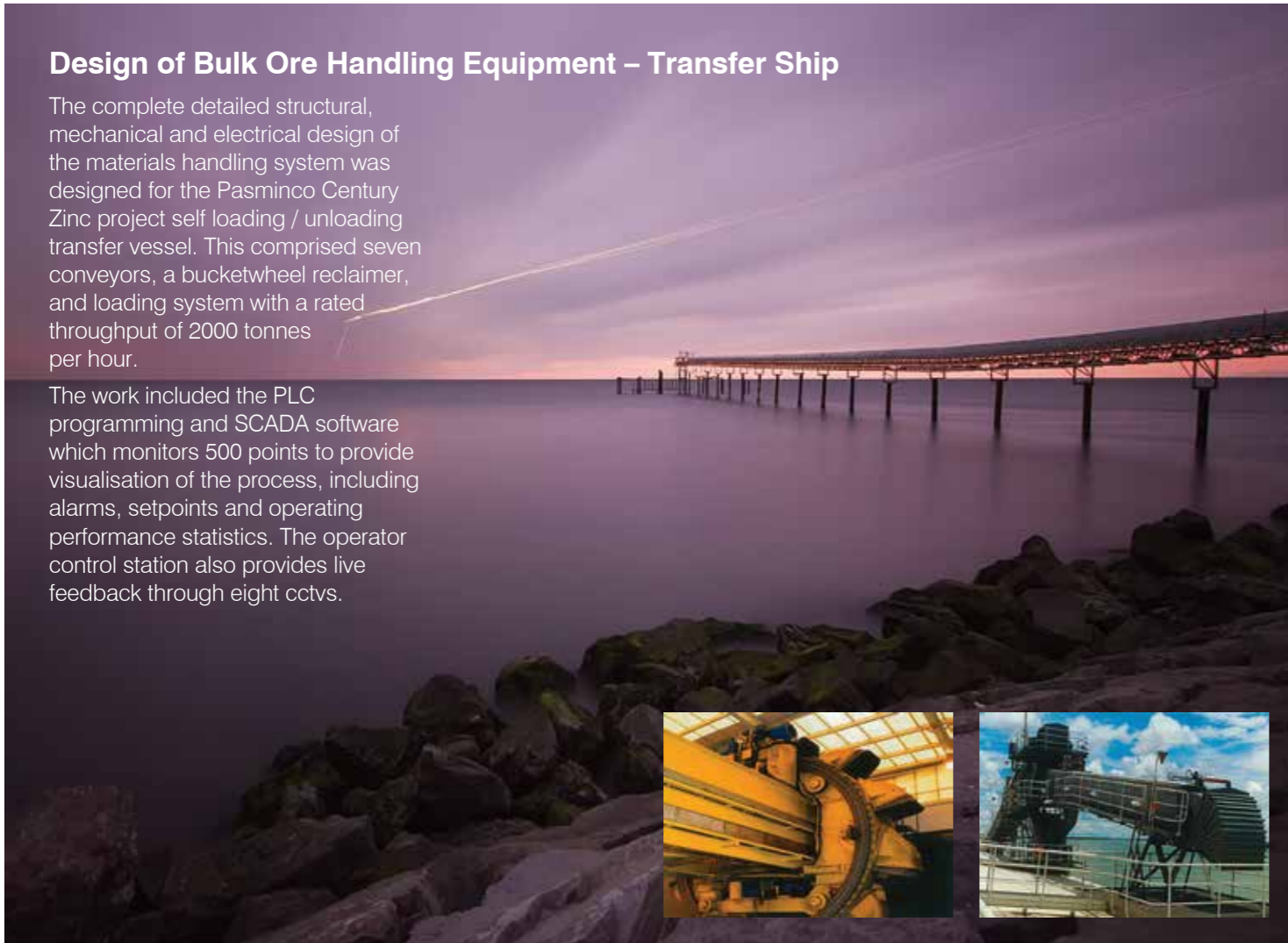
Projects

Summary details of some typical marine technology projects completed over the last few years serve to indicate the breadth of capability and expertise which the group is able to provide.

Design of Bulk Ore Handling Equipment – Transfer Ship

The complete detailed structural, mechanical and electrical design of the materials handling system was designed for the Pasminco Century Zinc project self loading / unloading transfer vessel. This comprised seven conveyors, a bucketwheel reclaimer, and loading system with a rated throughput of 2000 tonnes per hour.

The work included the PLC programming and SCADA software which monitors 500 points to provide visualisation of the process, including alarms, setpoints and operating performance statistics. The operator control station also provides live feedback through eight cctvs.



Lift/Drag Coefficients on Towed Vehicles using CFD



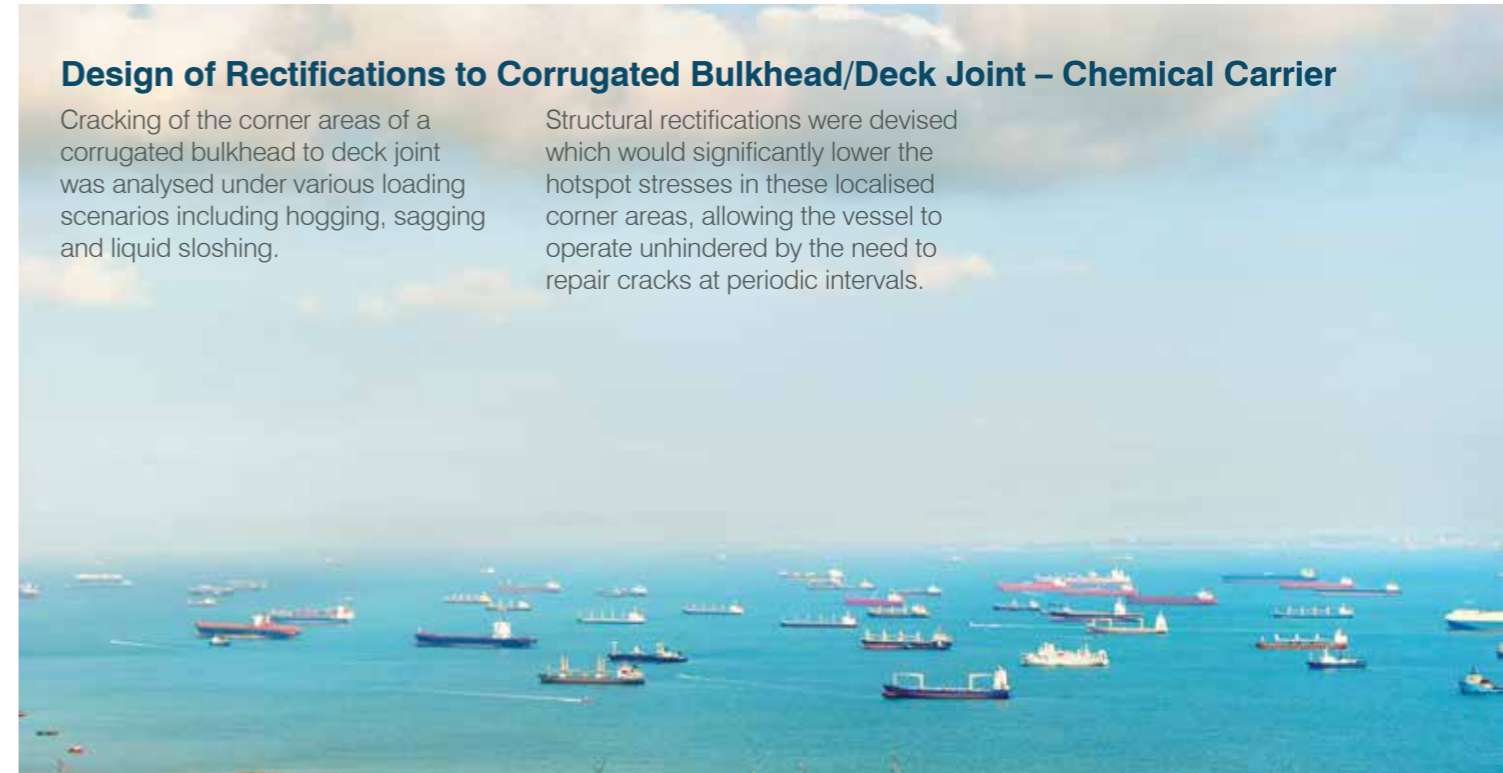
BMT WBM was involved in the development of a novel two-part sonar system used for coastal hydrographic surveys, where the sonar is towed behind the depressor unit, which is in turn towed by the survey vessel.

The dynamic stability of the depressor is critical in order to allow true tracking of the towed sonar and to dampen the motion of the surface vessel. The project involved investigation and evaluation of two design variants, using CFD to visualise the flow and calculate the lift/drag and manoeuvring coefficients.

Design of Rectifications to Corrugated Bulkhead/Deck Joint – Chemical Carrier

Cracking of the corner areas of a corrugated bulkhead to deck joint was analysed under various loading scenarios including hogging, sagging and liquid sloshing.

Structural rectifications were devised which would significantly lower the hotspot stresses in these localised corner areas, allowing the vessel to operate unhindered by the need to repair cracks at periodic intervals.



Assessment of Rail Wagon Lashing Systems – Ro-Ro Vessel



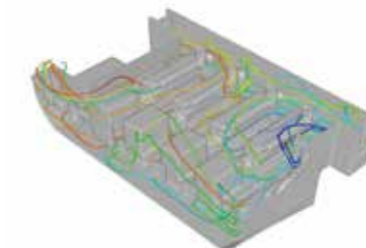
BMT WBM was requested to assess the forces in the lashing system used on a ro-ro vessel to secure grain wagons. A range of geometries was analysed, to cover the potential longitudinal variations of wagons with reference to the deck tie-down securing points. The full range of sea state conditions was assessed. Recommendations for improvements to the system were made, including strategic location of the higher / heavier wagons at the vessel midship areas.



Design Rectifications – Commando Watercraft Lifting Points

In-service cracking about the lift points of a commando watercraft was assessed, also in conjunction with the loading which would occur during deployment from the mother ship. The lift points were re-designed, including integration into the main hull structure, and the rectifications implemented throughout the fleet.

Analysis of Engine Room Ventilation System



Sea Keeping Trials - LARCS

Two LARC variants were instrumented and run through extensive surf trials in order to confirm typical manoeuvring limits and wave response characteristics.



Some BMT WBM clients:

- RAN AASSPO
- Army Marine
- Wartsila
- Maritime NZ
- ADI
- Pasminco
- Sydney Ferries
- Defence Maritime Services
- Silver Fern Shipping
- Stolt Australia
- Brisbane Slipways
- Forgacs
- P&O Nedlloyd

BMT WBM has a proven record in addressing today's engineering and environmental issues.

We aim to continue to enhance our services, capabilities and areas of application to meet the community's future development and environmental protection needs.



1 Number of BMT WBM offices in region

● BMT offices

BMT WBM Brisbane

Level 8
200 Creek Street
Brisbane Queensland 4000
PO Box 203 Spring Hill QLD 4004
Tel +61 7 3831 6744
Fax +61 7 3832 3627
Email bmtwbm@bmtwbm.com.au

BMT WBM Denver

Suite 120
8200 S. Akron Street
Centennial
Denver Colorado CO 80112
United States
Tel (+1) 303 792 9814
Fax (+1) 303 792 9742
Email denver@bmtwbm.com

BMT WBM Melbourne

Level 5
99 King Street
Melbourne Victoria 3000
PO Box 604 Collins Street West
VIC 8007
Tel +61 3 8620 6100
Fax +61 3 8620 6105
Email melbourne@bmtwbm.com.au

BMT WBM Newcastle

126 Belford Street
Broadmeadow New South Wales 2292
PO Box 266 Broadmeadow
New South Wales 2292
Tel +61 2 4940 8882
Fax +61 2 4940 8887
Email newcastle@bmtwbm.com.au

BMT WBM Northern Rivers

Suite 6
20 Byron Street
Bangalow New South Wales 2479
Tel +61 2 6687 0466
Fax +61 2 6687 0422
Email northern.rivers@bmtwbm.com.au

BMT WBM Perth

Level 3
20 Parkland Road
Osborne Park WA 6017
PO Box 1027 Innaloo WA 6018
Tel +61 8 9328 2029
Fax +61 8 9486 7588
Email perth@bmtwbm.com.au

BMT WBM Sydney

Suite G2
13-15 Smail Street
Ultimo Sydney New South Wales 2007
Tel +61 2 8960 7755
Fax +61 2 8960 7745
Email sydney@bmtwbm.com.au

BMT WBM United Kingdom

1st Floor
International House
St Katharine's Way
London
E1W 1AY
Tel +44 (0) 20 8090 1566
Email london@bmtwbm.co.uk

BMT WBM Vancouver

401 - 611 Alexander Street
Vancouver
British Columbia V6A 1E1
Canada
Tel (+1) 604 683 5777
Fax (+1) 604 608 3232
Email vancouver@bmtwbm.com